# IT Architecture Capability Maturity Model

## Introduction

The organizations of the Department of Commerce have made a heavy investment in the development of enterprise-wide IT Architectures. These efforts are a recognition that each Operating Unit's technical environment needs to possess a highly adaptive and enabling infrastructure that reduces integration complexity and lowers the total cost of ownership. We need to ensure that we continue to build on previous efforts and fully realize the benefits of IT Architecture.

Assessments of IT processes within an organization are needed to evaluate where we are and where we should be headed. The Department of Commerce has developed an IT Architecture Capability Maturity Model (CMM) to aid in conducting such assessments. The goal is to enhance the overall odds for success of the IT Architecture by identifying weak areas and providing a defined path towards improvement. As an Architecture matures it should increase the benefits it offers the organization.

Over the past few years many disciplines have developed capability maturity models designed to support process improvement. These include the areas of software development, systems engineering, integrated product and process development, and security. The process maturity model most IT organizations use or base their models on is the Software Engineering Institute's (SEI) Capability Maturity Model for describing the evolution of software development processes. An evolving/emerging best practice indicates that IT Enterprise Architecture organizations should similarly manage their IT Architecture efforts according to maturity models consistent with the rest of the IT organization.

The IT Architecture CMM developed by the Department provides a framework that represents the key components of a productive IT Architecture process. The CMM delineates an evolutionary way to improve the overall process that starts out in an ad hoc state, transforms into an immature process, and then finally becomes a well-defined, disciplined, and mature process. The CMM is intended to be used annually by each Operating Unit and each CIO to conduct an assessment of the Operating Unit's IT Architecture capability and progress.

The CMM provides three documents to be used as tools in the assessment process:

- The Department of Commerce IT Architecture Maturity Model
- Characteristics of Department of Commerce Operating Units' IT Architecture Processes at Different Maturity Levels
- Department of Commerce IT Architecture Capability Checklist.

# Department of Commerce IT Architecture Maturity Model[1]

| Level | Focus | Characteristics |
|---|---|---|
| 0 | No IT Architecture Program | No IT Architecture to speak of. |
| 1 | **Initial** - Informal IT Architecture Process Underway | Processes are ad hoc and informal. Some IT Architecture processes are defined. There is no unified architecture process across technologies and lines of business. Success depends on individual efforts. Quality of work is inconsistent. Little communication exists about the IT Architecture process and possible process improvements. |
| 2 | IT Architecture Process Is **Under Development** | Basic IT Architecture Process program is documented based on OMB Circular A - 130 and Department of Commerce IT Architecture Guidance. Responsibilities are assigned and work is underway. The architecture process has developed clear roles and responsibilities. There is a clear understanding of where the organization is at present time. **IT Vision, Principles, Baseline, and Target are identified.** |
| 3 | **Defined** IT Architecture Including Detailed Written Procedures and Technical Reference Model | The architecture is well defined and communicated. The process is largely followed. **Gap Analysis, Migration Plan, Technical Reference Model, Standards Profile, and Migration Plan are completed**. Cost-benefits are considered in identifying projects. IT goals and methods are identified. Training and awareness programs provided at regular intervals. **IT Architecture is integrated with strategic planning and budgeting processes.** |
| 4 | **Managed** and Measured IT Architecture Process | IT Architecture is used to guide development and acquisition. **IT Architecture is updated on a regular cycle to refresh the architecture content** and to adjust the strategic planning and budgeting processes based on the feedback received and lessons learned. IT Architecture projects are reviewed against architecture standards. **Quality metrics associated with the architecture process are captured.** These metrics include the cycle times necessary to generate IT Architecture revisions, technical environment stability, and time to implement a new or upgraded application or system. Organizational personnel understand the architecture and its uses. |
| 5 | **Optimizing** - Continuous Improvement of IT Architecture Process | **Architecture metrics are used to drive continuous process improvements** in IT Architecture. Process feeds Business Process Re-engineering and other characteristics. |

[1]Meta Group, "Enterprise Process Maturity Model and the SEI Model", Enterprise Architecture Strategies, File 16, July 28, 1998

# Characteristics of Department of Commerce Operating Units' IT Architecture Processes at Different Maturity Levels[1]

| Characteristics | Level 0: No Architecture | Level 1: Initial | Level 2 Under Development | Level 3: Defined | Level 4: Managed | Level 5: Optimizing |
|---|---|---|---|---|---|---|
| Business Linkage | No linkage to business strategies or business drivers. | Minimal, or implicit linkage to business strategies or business drivers. | Explicit linkage to business strategies. | Explicit linkage to business drivers, information requirements. | Periodic re-examination of business drivers. End-to-end process cycle time (business drivers to component definition) is measured. | Process metrics for business linkage driven into requirements-gathering process improvements. |
| Senior-Management Involvement | We do not need it. That won't work here Everything is fine the way it is. | What is Architecture? Why do we need it? | Management awareness of Architecture effort. Much nodding of heads. Some resistance to implications of having Architecture. | Management aware of Architecture effort and supportive. Management actively supports architectural standards. | Senior management reviews architecture process cycle times, variances. | Management involvement in optimizing process improvements in Architecture development and governance. |
| Operating Unit Participation | No part of Operating Unit participates or is involved with IT Architecture process. | "We support the architecture process as long as it represents the standards we have already chosen." Standards will only inhibit our ability to deliver business value. | Recognition that it is painful supporting too many kinds of technologies. Perhaps tired of distributing "not fully-developed or tested applications" to Operating Unit IT operations and support. | Recognition that architectural standards can reduce integration complexity and enhance overall ability to Operating Unit IT to achieve business goals. Most of Operating Unit participates actively in architecture definition. | Entire Operating Unit participates actively in architecture definition. | Feedback from all elements of Operating Unit on architecture process is used to drive architecture process improvements. |

[1]Meta Group, "Enterprise Process Maturity Model and the SEI Model", Enterprise Architecture Strategies, File 16, July 28, 1998

| Characteristics | Level 0: No Architecture | Level 1: Initial | Level 2 Under Development | Level 3: Defined | Level 4: Managed | Level 5: Optimizing |
|---|---|---|---|---|---|---|
| Architecture Process Definition | Does not exist. | Exists in ad-hoc or informal form. Early draft form may exist. | Being actively developed. Process definition not widely communicated. | Defined and communicated to IT staff and business management with LOB or Operating Unit IT responsibilities. | Architecture process is part of the culture, with strong linkages to other core IT and business processes. | Concerted efforts to optimize and continuously improve architecture process definition. Modeling of proposed process changes before implementation. |
| Architecture Development | No architecture at all. | No architecture to speak of. Some standards, established by a variety of ad hoc means. | Architecture standards exist, but not necessarily linked to overarching conceptual architecture. Technical Reference Model and Standards Profile framework established. | Architecture standards development linked to business drivers via conceptual architecture of principles and best practices. Partially completed Technical Reference Model and Standards Profile. | Component architectures defined by appropriate de-jure and de-facto standards. Fully developed Technical Reference Model and Standards Profile. Architecture conformance measured by deployed systems. | Same as Level 4, with process exceptions (standards waivers) used to improve architecture definition process. |
| Architecture Communication | None. | The “notebook” documenting the last version of the architecture. May have been handed out to IT staff. New IT staff may not automatically get copies. | The “notebook” is updated periodically or a Web site is used to document architecture deliverables. Few tools (e.g., office suite, graphics packages) are used to document architecture. Communication about architecture process via meetings, etc., may happen, but sporadic. | Architecture documents updated and expanded regularly. “Live” documentation of the architecture, via internal Web sites. Tools are used to support maintaining architecture documentation. Periodic presentations to IT staff on Architecture process, content. Likely a part of new-hire training. | Architecture documents are updated regularly, and frequency monitored across architecture content. Regular presentations to IT Staff on architecture process coverage in new-hire training. Tracking and reporting of architecture training to IT Staff (who took it, when). | Same as Level 4, with process exceptions (standards waivers) used to improve architecture communication process improvements. |

| Characteristics | Level 0: No Architecture | Level 1: Initial | Level 2 Under Development | Level 3: Defined | Level 4: Managed | Level 5: Optimizing |
|---|---|---|---|---|---|---|
| Governance | None. Everyone does their own thing. | No explicit governance of architectural standards. | Explicit governance of a few architectural standards (e. g. desktops, database management systems). Variances may go undetected in the design and implementation phases. | Explicit governance of the bulk of IT investments. Formal processes for managing variances. | Explicit governance of IT investments. Formal processes for managing variances feed back into architecture definition. | Same as Level 4, with process exceptions (standards waivers) used to improve architecture governance process. |
| Program Management | No formal project management discipline or skills. | Little project management discipline or skills. Lack of formal priority-setting mechanism for mission plans. | Planning and scheduling activities linked to time-based IT Architecture developments. Project risk and impact assessment conducted by the Operating Unit "IT Architecture Working Group". | Future IT staffing requirements based on target technical architecture. Change management procedures exist and are linked to formal architecture review. Adhere to formal project management methodology and conduct design review with the Operating Unit "IT Architecture Working Group". | Development of program initiatives includes participation by the Operating Unit "IT Architecture Working Group" representatives. Contingency planning requirements are fed into the IT Architecture planning cycle. | Value assurance program in effect. Mission continuity planning is a core competency and plans are refreshed based on target architecture and transition planning activities. |
| Holistic Enterprise Architecture | No formal modeling techniques and documentation. No inventory of mission processes, information entities or applications. | Mission, information and application requirements exist only within the technical architecture. | Basic application inventory exists and is maintained. Business models exist of parts of the mission. | Application inventory is linked to the mission. Systems are classified within a basic portfolio of technical condition and mission value. Enterprise business models exist and are used during design and development. | Application portfolio planning and business modeling manifest within the enterprise architecture process model. Modeling techniques and methods are re-examined periodically to ensure content is well understood and communicated. Model use is measured. | Metrics gathered at Level 4 drive process improvements. Enterprise portfolio replaces application portfolio. Enterprise portfolio encompasses business logic, data, infrastructure, services and business changes. Enterprise modeling is an automated competency. Models are kept current. |

| Characteristics | Level 0: No Architecture | Level 1: Initial | Level 2 Under Development | Level 3: Defined | Level 4: Managed | Level 5: Optimizing |
|---|---|---|---|---|---|---|
| IT Investment, and Procurement Strategy | No strategic IT procurement strategy. | Little or no adherence to existing Standards Profile.<br>Little or no involvement of strategic planning and procurement personnel in enterprise architecture process. | Some adherence to existing Standards Profile.<br>Little or no formal governance of purchasing and order content. | IT procurement strategy exists and includes compliance measures to IT Enterprise Architecture.<br>Adherence to existing Standards Profile.<br>RFQ, RFI and RFP content is influenced by the IT Architecture.<br>Acquisition personnel are actively involved in IT Architecture governance structure. | All planned IT acquisitions and purchases are guided and governed by the IT Architecture.<br>RFI and RFP evaluations are integrated into the IT Architecture planning activities.<br>Technology and application obsolescence plans are constructed and integrated into current baseline inventories. | No unplanned IT procurement activity. |

**Department of Commerce IT Architecture Maturity Model Checklist**[1]

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Business Linkage**: To what extent is the business involved in the definition of an Enterprise Architecture (EA) process in the organization? | | |
| Level 0: No business involvement in the EA process definition<br>1: Limited business involvement in the EA process definition<br>2: Limited business involvement in the EA process definition<br>3: Direct business involvement in the EA process definition<br>4: Business-owned EA process definition<br>5: Business involved in the optimization of the EA process definition | | |
| **Senior Management Involvement**: To what extent are the senior managers of Operating Unit involved in the establishment and ongoing development of an EA process? | | |
| Level 0: No management team awareness or involvement in the architecture process<br>1: Limited management team awareness or involvement in the architecture process<br>2: Occasional/selective management team involvement in the architecture process with various degrees of commitment/ resistance<br>3: Senior-management team supportive of the enterprise-wide architecture process<br>4: Senior-management team directly involved in the architecture review process<br>5: Senior-management team directly involved in the optimization of the enterprise-wide architecture process | | |
| **Senior Management Involvement**: To what extent is the EA development process used by senior managers to articulate future business strategies? | | |
| Level 0: No communication to the EA team on articulated future business strategies<br>1: Infrequent or limited communication to the EA team on articulated future business strategies<br>2: Periodic or occasional communication to the EA team on articulated future business strategies<br>3: Regular communication to the EA team on articulated future business strategies<br>4: Periodic EA team involvement in establishing future business strategies<br>5: The EA team directly involved in establishing future business strategies | | |

[1]Meta Group, "Architecture Maturity Audit: Part 2", Meta Practice, Volume 4, Number 5, May, 2000.

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Operating Unit Participation:** To what extent is the definition of the EA process accepted by the Operating Unit? | | |
| Level 0: No Operating Unit acceptance<br>1: Limited Operating Unit acceptance of the EA process definition<br>2: Limited Operating Unit participation in the development of the EA process definition<br>3: Largest elements of Operating Unit show acceptance of the EA process definition<br>4: The entire Operating Unit accepts the EA process definition<br>5: The EA process definition forms part of the ongoing business optimization | | |
| **Operating Unit Participation:** To what extent is the EA process definition phase an effort representative of the whole organization? | | |
| Level 0: No enterprise-wide definition effort<br>1: Localized individual support of EA process definition<br>2: Limited organization involvement<br>3: High level of organization involvement<br>4: Cross-enterprise architecture involvement<br>5: Entire organization represented in the architecture effort | | |
| **Architecture Process Definition:** Is there an established architecture process? | | |
| Level 0: Architecture process not established<br>1: Ad-hoc and localized architecture process defined<br>2: Draft process established for enterprise but not fully implemented across the Operating Unit<br>3: Architecture process defined and acted upon<br>4: Architecture process managed across the Operating Unit<br>5: Value of EA measured across entire EA process (business visioning to domain architectures — holistic EA) | | |
| **Architecture Development:** To what extent is the architecture development in the organization driven by a well established process? | | |
| Level 0: No defined process is used for an EA development.<br>1: Localized understanding of the EA process<br>2: Limited enterprise-wide understanding of the EA process, mostly used in the IT organization<br>3: Increasing enterprise-wide awareness of the EA process<br>4: A well-established enterprise-wide EA process<br>5: Continues optimization of the enterprise-wide EA process. | | |

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Architecture Development:** To what extent is the development and progression of the Operating Units' IT Architecture documented? | | |
| Level 0: No IT Architecture documentation to speak of.<br>1: IT Architecture processes and documentation are ad hoc, localized and informal.<br>2: IT Vision, Principles, Baseline, and Target are identified and documented.<br>3: Gap Analysis, Migration Plan, Technical Reference Model, Standards Profile, and Migration Plan are completed and documented.<br>4: IT Architecture documentation is updated on a regular cycle to reflect the updated the IT Architecture.<br>5: Defined and documented IT Architecture metrics are used to drive continuous process improvements. | | |
| **Architecture Communication:** To what extent are the decisions of EA practice documented? | | |
| Level 0: No documentation is available.<br>1: Limited documentation is available.<br>2: Architecture notebook is in use in the IT organization but is not updated regularly, and new hires are not necessarily brought in line with architecture decisions.<br>3: Architecture notebook is in use across organization, but not updated regularly.<br>4: Architecture notebook is in use across the organization and in step with latest architecture developments/standards.<br>5: Architecture notebook is in use by every decision maker in the organization for every business decision. | | |
| **Architecture Communication:** To what extent are other methods/tools of communications used? | | |
| Level 0: No communications tools used.<br>1: Few communications tools used or limited use of tools<br>2: Regular EA presentations at management meetings<br>3: Architecture (education) town meetings held at various Operating Units<br>4: Ongoing education on the value of an e architecture across Operating Units<br>5: Various education/communication tools utilized across all Operating Units | | |

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Architecture Communication:** To what extent is the content of the EA process made available electronically to everybody in the organization? | | |
| Level 0: No electronic means of communication<br>1: Limited electronic means of communication<br>2: Occasional updates published via e-mail<br>3: More widespread electronic publication of standards<br>4: An online Web site is used to force communications across the organization<br>5: All Operating Units are actively involved through electronic updates and Web chat rooms | | |
| **Architecture Communication:** To what extent is architecture education done across the business on the EA process and contents? | | |
| Level 0: No education<br>1: Limited education<br>2: Architecture education done for IT staff<br>3: More widespread education done across various Operating Units<br>4: Most Operating Units participate actively in EA education<br>5: All Operating Units monitor staff education and understanding | | |
| **Governance:** To what extent do senior managers subscribe to the governance process as set out in the EA development process? | | |
| Level 0: No agreement with governance structure<br>1: Limited agreement with governance structure<br>2: Various degrees of understanding of the proposed governance structure<br>3: Supportive of enterprise-wide architecture standards and subsequent required compliance<br>4: Senior-management team owns the compliance process for enterprise-wide architecture standards<br>5: Senior-management team maintains an enterprise-wide governance structure (ownership of EA standards) | | |
| **Program Management:** Is there an established enterprise program management function? | | |
| Level 0: No program management functions<br>1: Limited program management functions on an ad-hoc basis<br>2: Defined program management functions performed in the IT organization<br>3: Operating Unit-level defined program management functions established<br>4: Senior management and Operating Unit agreed-to enterprise-wide program management functions<br>5: Enterprise-wide program management is established as a technology investment optimization tool across the organization | | |

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Program Management:** To what extent are planning and scheduling activities linked to time-based architecture development? | | |
| Level 0: No linkage<br>1: Some local linkages to architecture exist on an ad hoc basis<br>2: Limited linkage within the Operating Unit IT organization<br>3: Direct linkage from a technology decision perspective<br>4: Senior management linkage between business decisions and architecture development<br>5: Direct and optimized linkage between technology investments and business driven EA development | | |
| **Holistic Enterprise Architecture:** To what extent is a holistic EA approach followed? | | |
| Level 0: No enterprise-wide technical architecture (EWTA) process<br>1: Only localized technical architecture process in place<br>2: Limited business and information requirements documented as part of the EWTA development<br>3: A high level business architecture is defined with specific reference to business models and processes as well as an information architecture defining the flows of information across various business processes<br>4: An application portfolio has been established driving future business solutions<br>5: A fully populated enterprise solutions portfolio is replacing the application portfolio | | |
| **Holistic Enterprise Architecture:** To what extent is enterprise business modeling an automated competency of line managers and staff? | | |
| Level 0: No modeling competency exists<br>1: Technical models exist of IT Architecture infrastructure<br>2: Limited business modeling is done on a Operating Unit basis<br>3: Enterprise-wide business modeling is done<br>4: Each Operating Unit management has the competency to drive business modeling and process optimization<br>5: Enterprise business modeling is the competency of line management and staff and models is well documented | | |

| Checklist Item | Current FY | Next FY |
|---|---|---|
| **Holistic Enterprise Architecture:** Is EA a centralized or decentralized process, and is it driven by a governance structure and compliance process? | | |
| Level 0: No organization-wide EA process in place<br>1: EA process carried out in an ad-hoc manner in limited areas.<br>2: Only governance for technology procurement done on an Operating Unit basis<br>3: Organization-wide EA process defined but executed decentralized in IT and various Operating Units<br>4: Cross-enterprise EA execution according to a well-established governance structure<br>5: Enterprise-wide EA optimized to enable the future strategies of the organization | | |
| **IT Investment and Procurement Strategy:** To what extent does the Enterprise Architecture influence the IT Investment and Procurement Strategy? | | |
| Level 0: No regard for Enterprise Architecture in formulation of strategic IT procurement strategy by Operating Unit.<br>1: Little involvement of strategic planning and procurement personnel in enterprise architecture process.<br>2: Little or no formal governance of IT Investment and Procurement Strategy. Operating Unit demonstrates some adherence to existing Standards Profile.<br>3: Operating Unit adheres to existing Standards Profile. RFQ, RFI and RFP content is influenced by the IT Architecture<br>4: All planned IT acquisitions and procurements are guided and governed by the IT Architecture.<br>5: Operating Unit has no unplanned IT investment or procurement activity. | | |